Q. 78 If A and B are symmetric matrices, then

(i) $AB - BA$ is a ....

(ii) $BA - 2AB$ is a ....

Sol. (i) $AB - BA$ is a skew-symmetric matrix.

Since,
$$[AB - BA]' = (AB)' - (BA)'$$
$$= B'A' - A'B' \quad [\because (AB)' = B'A']$$
$$= BA - AB \quad [\because A' = A \text{ and } B' = B]$$
$$= -[AB - BA]$$

So, $[AB - BA]$ is a skew-symmetric matrix.

(ii) $[BA - 2AB]$ is a neither symmetric nor skew-symmetric matrix.

$\therefore$
$$(BA - 2AB)' = (BA)' - 2(AB)'$$
$$= A'B' - 2B'A'$$
$$= AB - 2BA$$
$$= -(2BA - AB)$$

So, $[BA - 2AB]$ is neither symmetric nor skew-symmetric matrix.